Claims

1. A method for isolating nucleic acid molecules from tissue samples comprising:
   i) treating a tissue sample with at least one enzyme for tissue dissociation;
   ii) adding a lytic solution;
   iii) isolating nucleic acid molecules.

2. The method of claim 1,further comprising a step of applying hydrodynamic shear force to the product of step (i).

3. The method of claim 2, the method comprising:
   incubating in a first chamber a mixture of: at least one tissue sample, at least one enzyme for dissociation of the tissue sample, and buffer solution;
   disrupting the tissue sample in a second chamber acting as tissue disruption channel;
   lysing cells isolated from the tissue disruption channel in a third chamber; and
   collecting and isolating desired nucleic acid molecules and/or proteins in a fourth chamber.

4. The method of claim 3, wherein the incubation in the first chamber is carried out at a constant temperature.

5. The method of claims 3-4, wherein hydrodynamic shear force applied within the tissue disruption channel gradually reduces the tissue sample size until it is fully disrupted and cells are released.

6. The method of claims 1-5, wherein the enzyme for tissue dissociation is chosen according to the tissue sample.

7. The method of claims 1-6, wherein the enzyme for tissue dissociation is a protease, cellulase and/or lipase.

8. The method of claim 7, wherein the protease is collagenase, trypsin, chymotripsin, elastase, papain, chymopapain, hyaluronidase, pronase, dispase, thermolysin, bromelain, cathespines, or pepsin, or a mixture thereof.

9. The method of claims 1-8, wherein the nucleic acid molecules are recovered and isolated from the solution by: adding beads coated with at least one linker and recovering the nucleic acid molecules bound to the linkers.

10. The method of claim 9, wherein the beads are magnetic beads and are collected by an external or internal magnetic field.

11. The method of claims 1-10, wherein the isolated nucleic acid molecule is mRNA, RNA and/or DNA.

12. The method of claim 9, wherein the linker comprises oligo d(T).

13. The method of claim 9, wherein the free end of the linker comprises at least one nucleotide N, wherein N is A, G, C, T or U.

14. The method of claims 1-13, wherein the tissue sample is animal-, human-, plant-, or adipose-originated tissue.

15. A system for isolation of cells from tissue samples, the system comprising an enzymolytic tissue dissociation chamber and a tissue disruption channel.

16. The system of claim 15, further comprising isolating nucleic acid molecules.

17. The system of claim 15, comprising:
a first enzymolitic tissue dissociation chamber for incubation of a mixture of: at least one tissue sample, at least one enzyme for dissociation of the tissue sample, and buffer solution; and
a second chamber acting as a tissue disruption channel.

18. The system of claim 17, further comprising a chamber for recovery of the isolated cells.

19. The system of claims 15-18, comprising:
a first enzymolitic tissue dissociation chamber for incubation of a mixture of: at least one tissue sample, at least one enzyme for dissociation of the tissue sample, and buffer solution;
a second chamber acting as a tissue disruption channel;
a third chamber comprising a lytic solution;
a fourth chamber for the collection and isolation of nucleic acid molecules and/or proteins ; and
a fifth chamber for waste collection;
wherein the chambers are connected to each other.

20. The system of claim 19, wherein the tissue disruption channel comprises:
an inlet port;
at least one region of constriction; and
an outlet port.

21. The system of claims 15-20, wherein the tissue disruption channel at the region(s) of constriction has a smaller cross-sectional area compared to the overall cross-sectional area of the disruption channel.

22.The system of claims 15-21, wherein the enzymolytic tissue dissociation chamber accepts at least one tissue sample and at least one enzyme for tissue dissociation.

23.The system of claims 15-22, wherein the enzymolytic tissue dissociation chamber is less than 100 μl in volume.

24.The system of claims 15-22, wherein the enzymolytic tissue dissociation chamber is less than 50 μl in volume.

25. The system of claims 15-22, wherein the enzymolytic tissue dissociation chamber is less than 10 μl in volume.

26.The system of claims 15-22, wherein the enzymolytic tissue dissociation chamber is less than 5 μl in volume.

27.The system of claim 22, wherein the enzyme for tissue dissociation is a protease, a cellulase or a lipase.

28.The system of claim 27, wherein the protease is collagenase, trypsin, chymotripsin, elastase, papain, chymopapain, hyaluronidase, pronase, dispase, thermolysin, bromelain, cathespines, or pepsin, or a mixture thereof.

29.The system of claim 22, wherein the enzyme for tissue dissociation is chosen according to the tissue sample.

30.The system of claims 15-29, wherein the tissue sample is animal-, human-, plant-, or adipose-originated tissue.

31.The system of claims 15-30, wherein the system is a biological microelectromechanical system (bioMEMS) and/or a fully automated complete micrototal analytical system (μTAS).

32.The system of claims 15-31, wherein the system is disposable.

33.The system of claims 15-32, wherein the system is part of a diagnostic integrated system suitable for forensic testing, clinical diagnostics, veterinary and/or agricultural diagnostics.

34.The system of claims 15-33, wherein the system is an automated nucleic acid extractor.

35. A method for cell isolation from tissue samples comprising:

(a) treating a tissue sample with at least one enzyme for tissue dissociation;

(b) applying hydrodynamic shear force to the product of step (a);

(c) recovering the isolated cells.

36.The method of claim 35, further comprising: adding a lytic solution to the isolated cells.

37.The method of claims 35-36, further comprising: recovering nucleic acid molecules.

38.The method of claims 35-37, wherein the enzyme for tissue dissociation is chosen according to the tissue.

39.The method of claims 35-38, wherein the enzyme for tissue dissociation is a protease, cellulase or lipase.

40.The method of claim 39, wherein the protease is collagenase, trypsin, chymotripsin, elastase, papain, chymopapain, hyaluronidase, pronase, dispase, thermolysin, bromelain, cathespines, or pepsin, or a mixture thereof.

41.The method of claims 35-40, wherein the nucleic acids are isolated by: adding beads coated with at least one linker and recovering the nucleic acid molecules bound to the linkers.

42.The method of claim 41, wherein the beads are magnetic beads and are collected by an external or internal magnetic field.

43.The method of claims 35-42, wherein the isolated nucleic acid molecule is mRNA, RNA and/or DNA.

44.The method of claim 43, wherein the linker comprises oligo d(T).

45.The method of claim 44, wherein the free end of the linker comprises at least one nucleotide N, wherein N is A, G, C, T or U.

46.Use of the system of claims 15-45, wherein the system is part of a diagnostic integrated system in forensic testing, clinical diagnostics, veterinary and/or agricultural diagnostics.